Different intensities of warm up: effects on strength training

Pedro P. Neves[1,2], Ana R. Alves[2,3], António C. Sousa[1,2], Mª Helena Gil[1,2], Luís B. Faíl[1,2], Mário, C. Marques[1,2], Daniel A. Marinho[1,2], Henrique P. Neiva[1,2]

[1]Department of Sport Sciences, University of Beira Interior, Covilhã, Portugal,
[2]Research Center in Sports Sciences, Health Sciences & Human Development, CIDESD, Covilhã, Portugal,
[3]Department of Arts, Humanities and Sports, Polytechnic Institute of Beja, Beja, Portugal.

Acknowledgments: This project was supported by the National Funds through FCT – Portuguese Foundation for Science and Technology (UID/DTP/04045/2013) – the European Fund for Regional Development (FEDER) allocated by European Union through the COMPETE 2020 Programme (POCI-01-0145-FEDER-006969) – competitiveness and internationalization (POCI).

Different intensities of warm up: effects on strength training

INTRODUCTION: Warm-up is considered an essential part of the exercise and training performance, preventing from injuries and optimizing physical activity performances (Fradkin, Zazryn & Smolig, 2010). Not much is known about the effects of preparation activities on muscle performance, and, more specifically, on strength training performance (McGowan, Pyne, Thompson & Rattray, 2015). The current study aimed to verify the effect of two different intensities of specific warm-up in a full-squat training set.

METHODS: The full-squat exercise was evaluated regarding the mechanical responses, such as the mean propulsive velocity (MPV), mechanical power (MP) and velocity loss (VL). The physiological and psychophysiological responses (heart rate, tympanic temperature, blood lactate concentration and subjective perception of effort) were also recorded. Fourteen male subjects, aged between 19 and 35 years old (mean ± SD: 24.43 ± 3.98 years-old, 77.71 ± 10.35 kg of body mass, 1.75 ± 0.07 m of height), performed a low-intensity (6 repetitions of 40% of training load) and a high-intensity warm-up (6 repetitions of 80% of training load). Then, after 5min of passive rest, they performed a training set comprising 3x6 repetitions of 80% of 1 repetition maximum (1RM) with 3min of rest.

RESULTS: Differences were found in MPV during the 2nd set (0.61 ± 0.09 *vs.* 0.66 ± 0.05 $m.s^{-1}$; p = 0.01, d = 0.79) and in the 3rd set (0.60 ± 0.08 *vs.* 0.64 ± 0.07 $m.s^{-1}$; p = 0.04, d = 0.59) with higher values for the high-intensity warm-up. Also, higher MP values were found during the 2nd (2696 ± 577 *vs*. 2938 ± 554 W; p = 0.03, d = 0.67) and the 3rd training sets (2683 ± 577 *vs*. 2880 ± 598 W; p = 0.04, d = 0.61) when high-intensity warm-up was used. Moreover, the maximal MP values were obtained in warm-up with higher intensities (p = 0.01, d = 0.58, respectively). These results could be caused by the increased tympanic temperature (35.94 ± 0.45 *vs*. 36.47 ± 0.54 ºC; p = 0.04, d = 0.62) and lactate values (1.96 ±

48 0.70 *vs.* 2.59 ± 0.56 mmol.l^{-1}; p = 0.01, d = 0.88) recorded after the high-intensity warm-up
49 procedure.
50 CONCLUSIONS: The results showed that specific warm-up with 80% of training load
51 resulted in better performance in a full-squat training set. It seems that higher intensities of
52 warm-up may be more effective for strength training optimization.
53 REFERENCES:
54 Fradkin, A.J., Zazryn, T.R., & Smoliga, J.M. (2010). Effects of warming-up on physical
55 performance: a systematic review with meta-analysis. *The Journal of Strength and*
56 *Conditioning Research, 24(1), 140-148.* doi: 10.1519/JSC.0b013e3181c643a0
57 McGowan, C. J., Pyne, D. B., Thompson, K. G., & Rattray, B. (2015). Warm-up strategies
58 for sport and exercise: mechanisms and applications. *Sports Medicine, 45(11), 1523-*
59 *1546.* doi: 10.1007/s40279-015-0376-x
60